

THE NASA DISCOVERY STARDUST PROJECT

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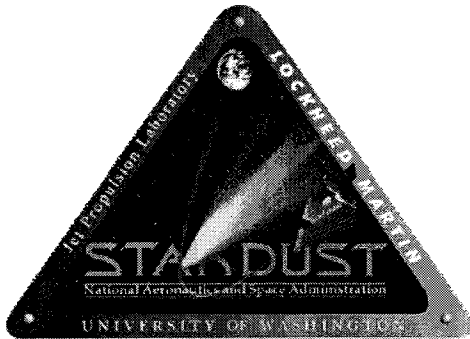
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The NASA Discovery STARDUST Project, a comet particle sample return mission, has been in flight for over 1 year and during this time period has operated all flight instrumentation: the Max Planck Institute Cometary and Interstellar Dust Analyzer (CIDA), the University of Chicago Dust Flux Monitor Instrument (DFMI), and the Jet Propulsion Laboratory Imaging Camera. The Aerogel Collector is deployed, currently collecting interstellar dust particles. Two engineering subsystems, Attitude Control and Radio Navigation, are also operating and will provide information on dust particle size and distribution at comet Wild 2, the primary target for collecting cometary dust in 2004 for return to earth in 2006.

This work was carried out at the Jet Propulsion Laboratory, California Institute of Technology under contract to the National Aeronautics and Space Administration Discovery Program.

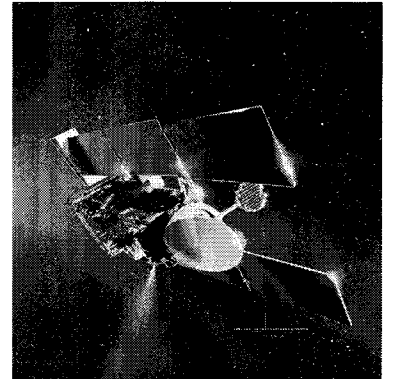
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THE NASA DISCOVERY STARDUST MISSION



by

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***EGS General Assembly XXVI
Nice, France
24-29 April 2001***

STARDUST

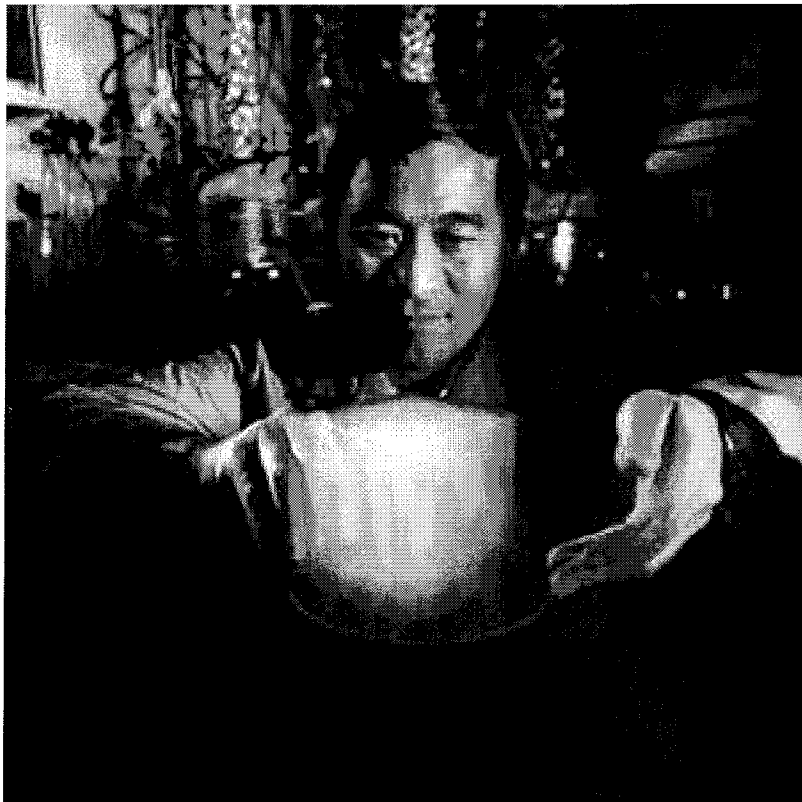
- ***4th NASA Discovery Project***
 - ***Mars Pathfinder, NEAR, Lunar Explorer prior Missions***
- ***1st NASA Unmanned Planetary Sample Return Mission***
- ***NASA, Univ of WA, JPL and LMA Partnership***
- ***Prof. Donald Brownlee, University of Washington, PI***
 - ***Co-I's***
 - Drs. Martha Hanner, JPL, Fred Horz, JSC,***
 - Marcia Neugebauer, JPL, Ray Newburn, Jr., JPL,***
 - Scott Sandford, ARC, Zdenek Sekanina, JPL, and***
 - Mike Zolensky, JSC***
- ***Payload Instruments***
 - Aerogel Collector - Dr. Peter Tsou, Deputy PI - JPL, and Co-I Team***
 - CIDA - Dr. Jochen Kissel, MPI fur Kernphysik, and Team***
 - DFMI - Dr. Anthony J. Tuzzolino, U of Chicago, and Team***
 - NavCam - Facility Instrument for Co-I Team (Newburn - Lead)***
 - Radio Science - Dr. John Anderson, JPL, and Team***
 - High Rate Attitude - Dr. Benton Clark, LMA, and Team***

STARDUST SCIENCE OBJECTIVES

- Primary Requirement: Collect 1000 Comet particles $>15\ \mu\text{m}$ at encounter velocity $< 6.5\ \text{km/sec}$ and return to Earth
- Secondary Requirements: Collect 100 Interstellar particles $>0.1\ \mu\text{m}$ and return to Earth.
Provide ≥ 65 images of P/Wild 2, having a resolution of at least $67\ \mu\text{rad}$ per pixel, taken within 2000 km of the comet nucleus through selected filters;
Provide in situ particle analysis for comet coma flythrough capable of resolving abundant elements in cometary solids
- Tertiary Requirements: Provide in situ particle analysis for interstellar and interplanetary dust;
Collect comet coma molecules and return to Earth;
Measure dust mass fluence, large particles and comet mass upper limit
Provide dust flux measurement of $10^{-9}\ \text{g}$ to $1\ \text{g}$ particles

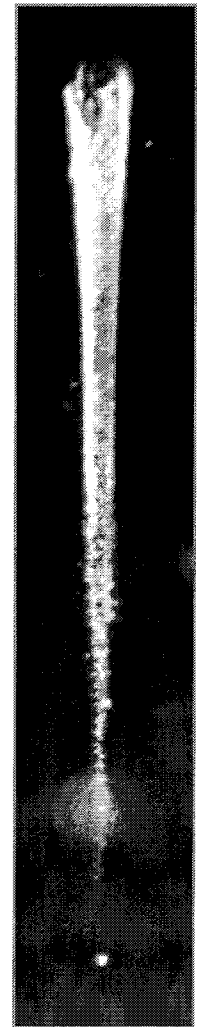
AREOGEL

Coma & Interstellar Dust Collection

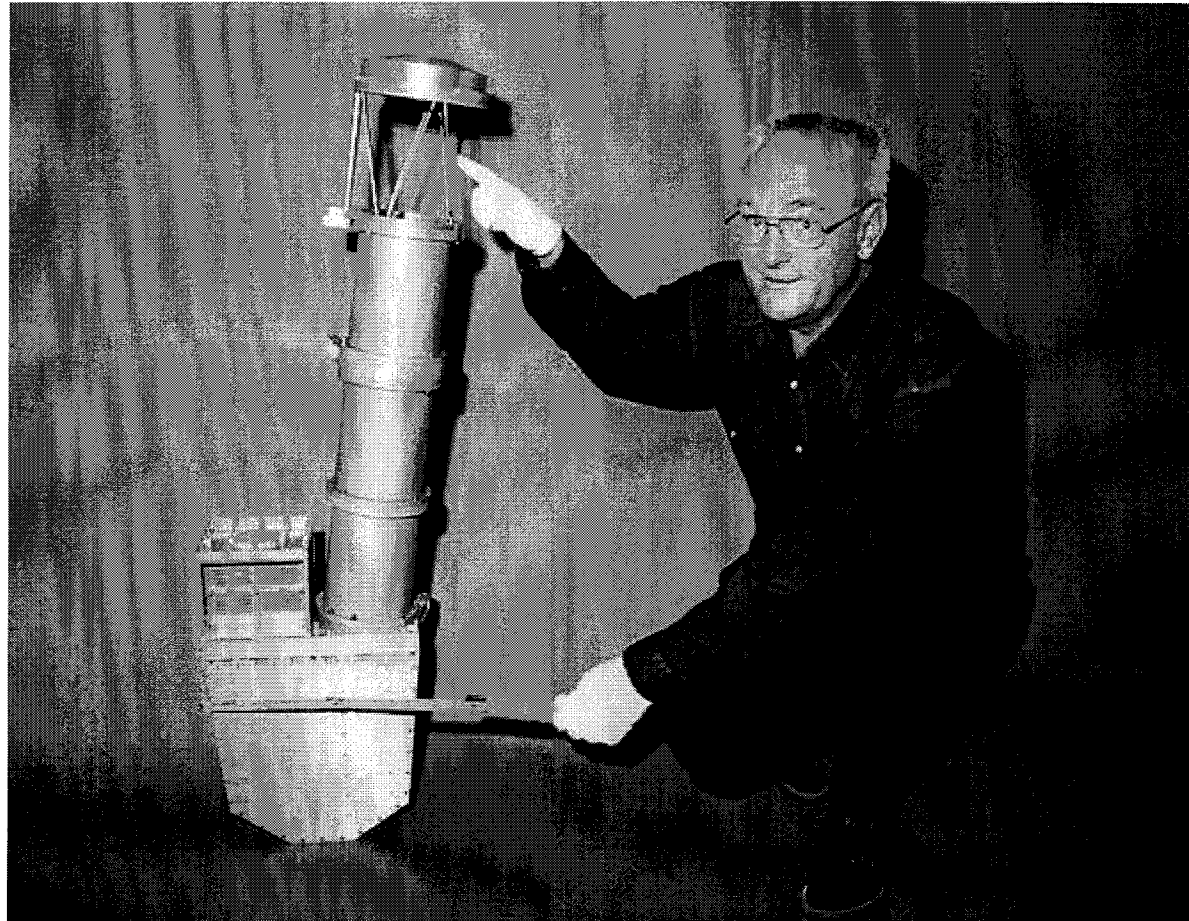


Dr. Peter Tsou, Deputy PI

To collect the particles without damaging them, STARDUST will use an extraordinary substance called aerogel - a silicon-based solid with a porous, sponge-like structure in which 99 percent of the volume is empty space. Aerogel is 1,000 times less dense than glass, another silicon-based solid. When a particle hits the aerogel, it will bury itself in the material, creating a carrot-shaped track up to 200 times its own length, as it slows down and comes to a stop - like an airplane setting down on a runway and braking to reduce its speed gradually. Since aerogel is mostly transparent - sometimes called blue smoke - scientists will use these tracks to find the tiny particles.



MPI für Kernphysik CIDA



Dr. Jochen Kissel with CIDA

University of Chicago - Dust Flux Monitor Instrument

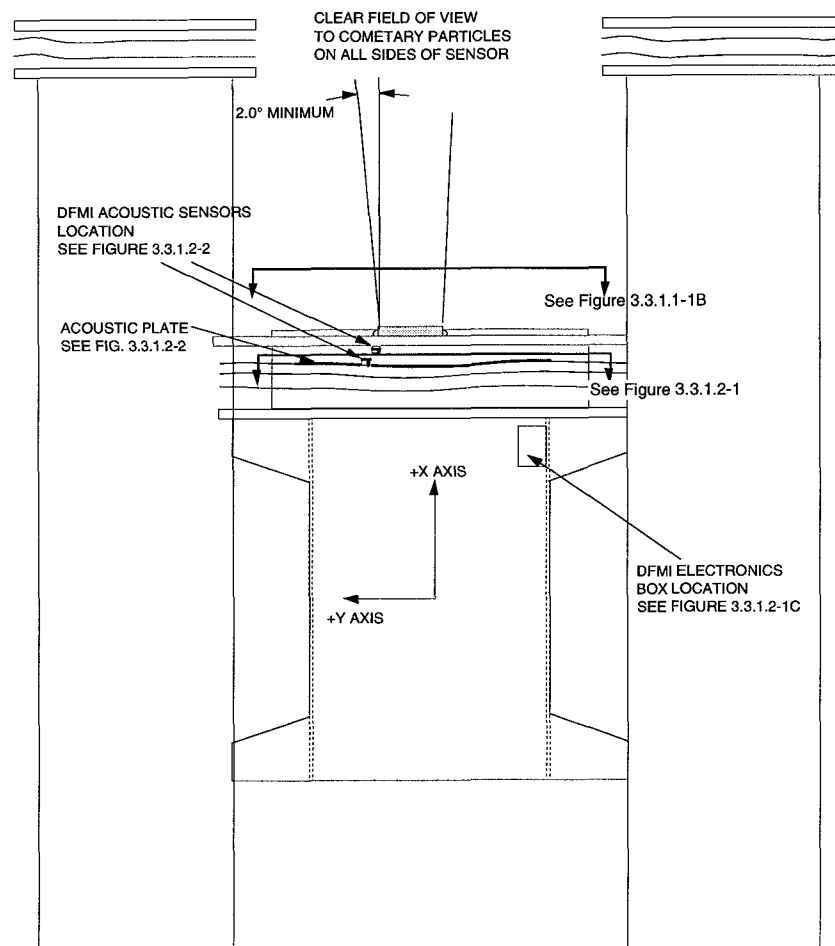
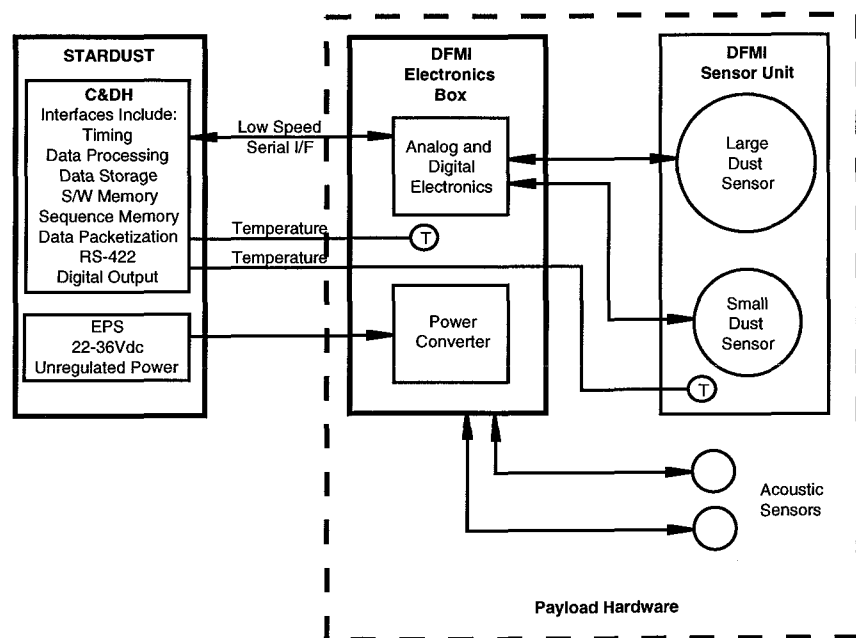
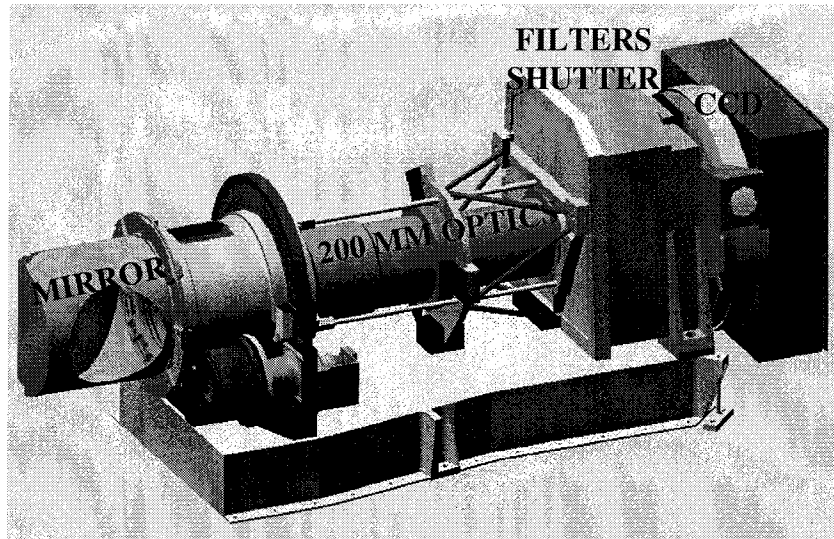


FIGURE 3.3.1.1-1 DFMI LAYOUT ON SPACECRAFT
(NO SCALE)

JPL CAMERA



CHARACTERISTICS

200 mm VGR WA Optics

1024 x 1024 Cassini CCD

60 μ rad / pixel

1 Deg-of-freedom Mirror (200 deg)

8 Filters

5140 \pm 60 C₂ (Blue)

5800 \pm 20 Yellow Continuum

5900 \pm 1000 Hi Res (Nucleus)

6340 \pm 60 O[¹D]

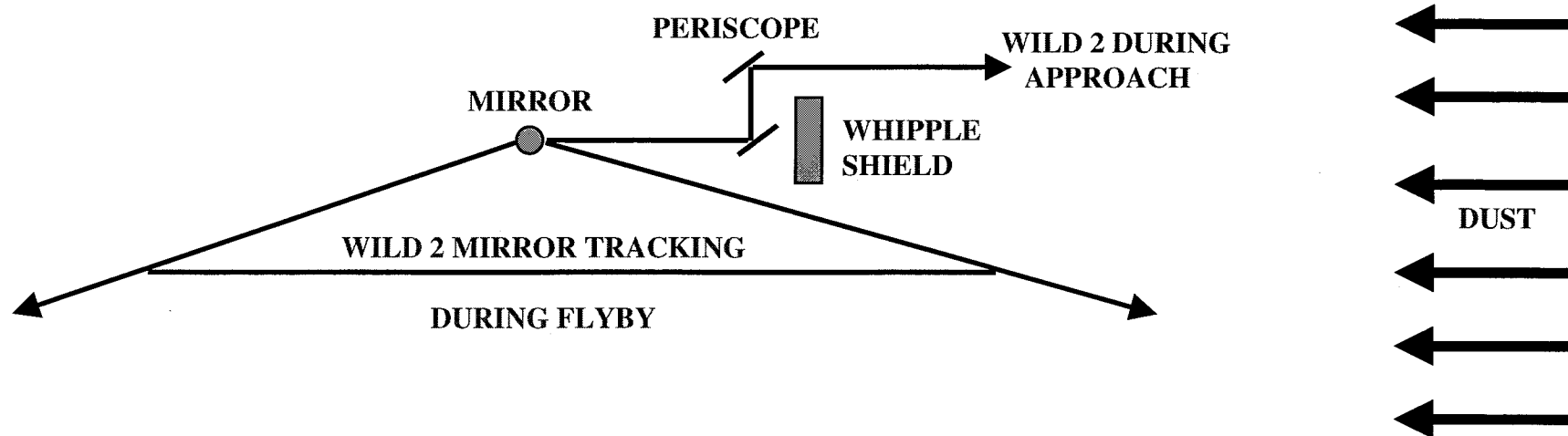
6650 \pm 75 NH₂

7000 \pm 2000 Navigation

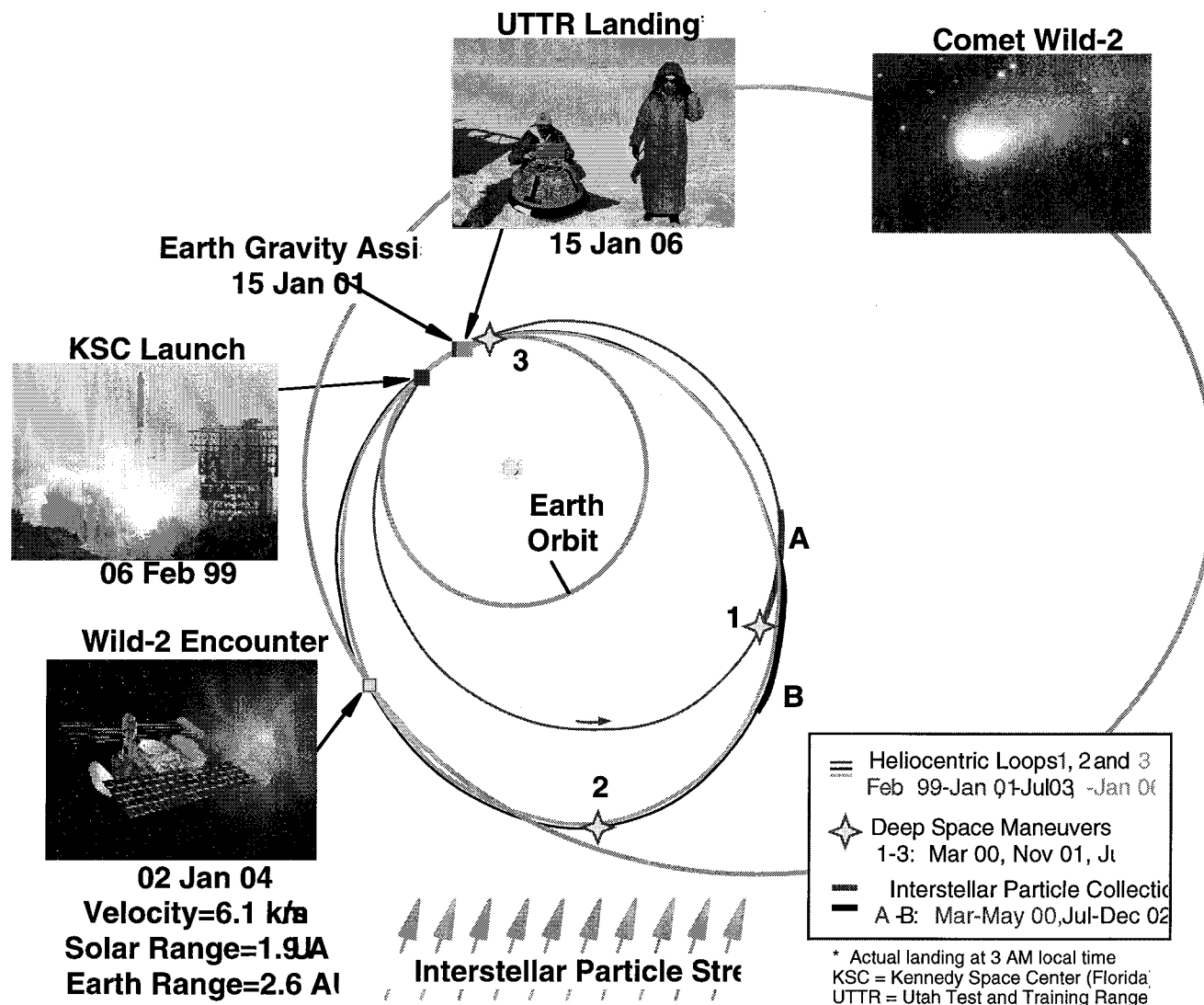
7130 \pm 30 Red Continuum

8700 \pm 150 Near IR

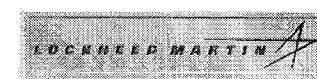
Periscope - protect optics during approach



STARDUST MISSION



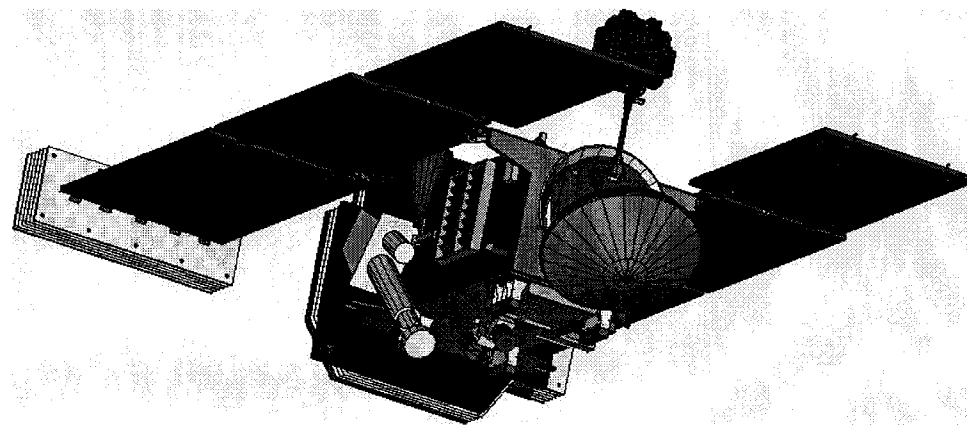
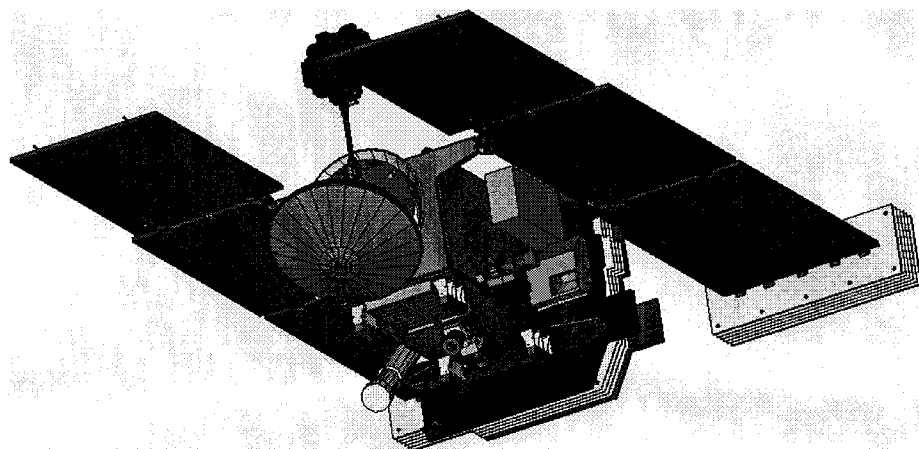
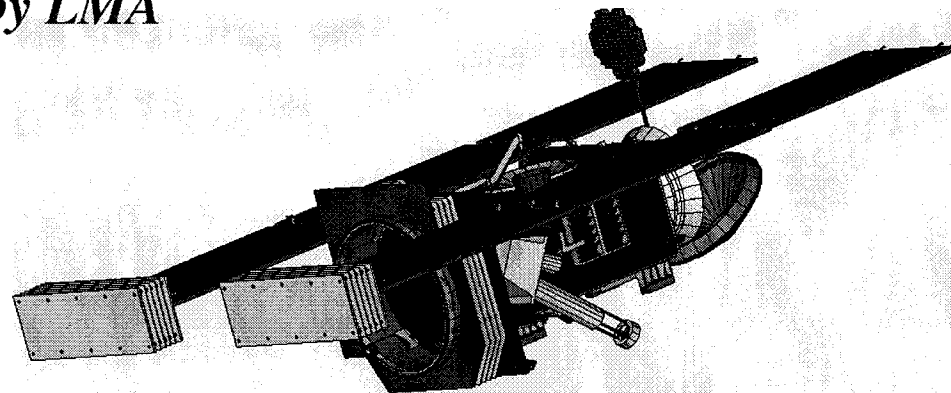
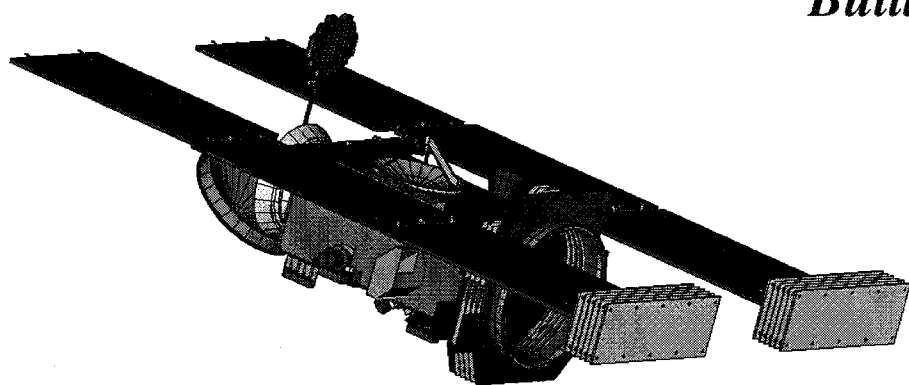
J



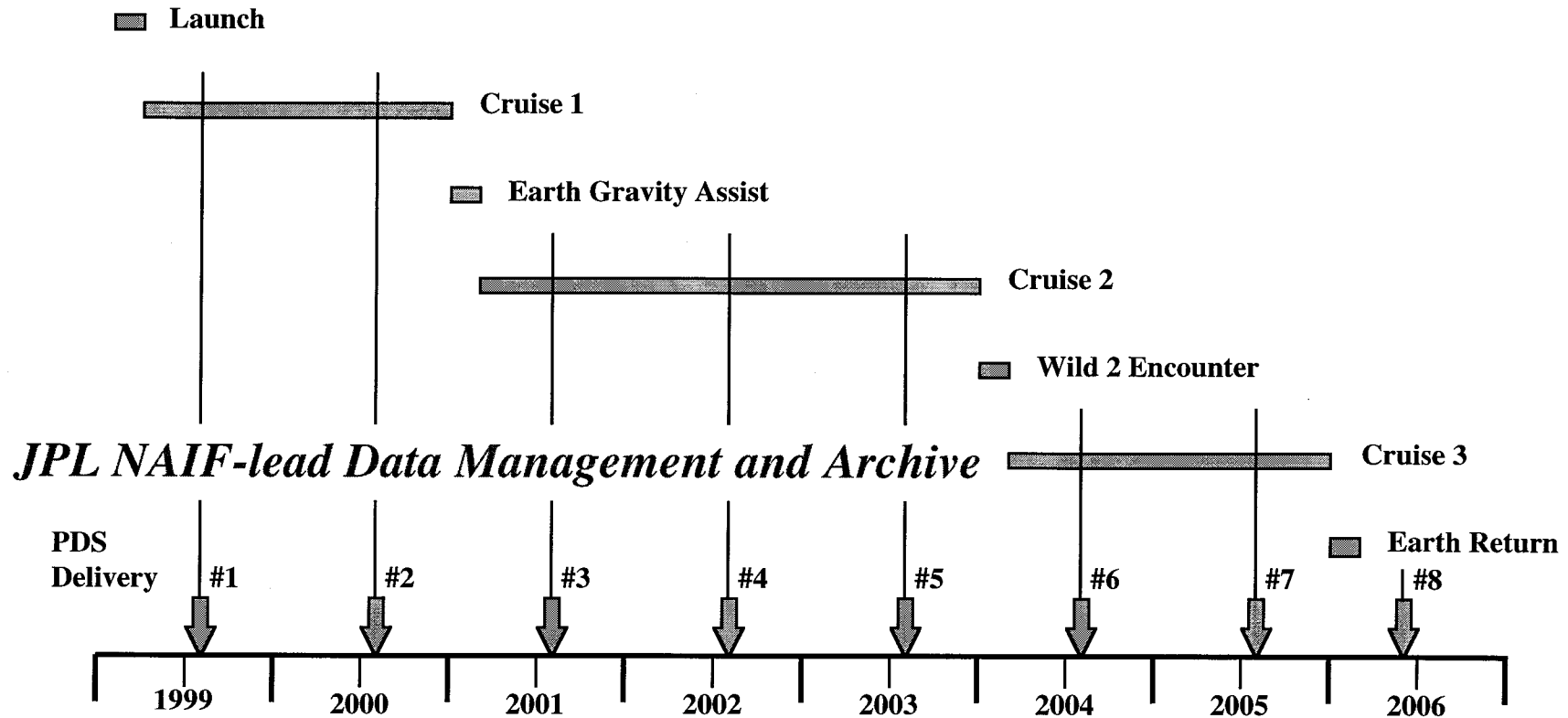
P/WILD 2 ENCOUNTER



STARDUST SPACECRAFT
Built by LMA



***RELEASE OF PROJECT DATA
to the
PLANETARY DATA SYSTEM***



***Particles to be Delivered to JSC Office of Curation
International Analysis Program will Follow***